THIRD QUARTERLY REPORT
FOR
EQUIVALENT SOURCE MODELING OF THE MAIN FIELD USING MAGSAT DATA

Contract NAS 5-26047

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During this quarterly period the following modeling and software development work has been done.

(1) A graphic software package has been developed to plot the dipole positions for a particular model on a world map. An arrow is drawn at each dipole in the direction of the horizontal magnetization vector, with length proportional to the horizontal magnitude. A contouring package represents the radical component of the magnetization vector. This software is in the final stage of verification.

(2) Based on quiet MAGSAT data for November 5 and 6 (the MGST(6/80) data set), several dipole models defined in Table 1 have been derived. These models are being evaluated against one another and MGST(6/80) as to goodness of fit and stability of solution. The spatial power spectra computed from spherical harmonic expansions of the dipole models is being analyzed relative to crustal and core content. Figure 1 displays the power spectra for one of the dipole models and a spherical harmonic model based on MAGSAT data through degree and order 23.

Work planned for the next quarter includes further analysis of the derived models listed in Table 1 plus the derivation of an unconstrained 16° x 16° dipole density model. The software will be enhanced to include time dependence (linear) in the dipole magnetization vector. This will facilitate the processing of available quiet MAGSAT data covering several months in time. It is anticipated that such a model will provide a useful tool for the reduction of MAGSAT data for anomaly studies.

Table 1

Model #	Dipole Density at core/mantle boundary	# dipoles	(constrained/ unconstrained) # degrees of freedom	Geocentric Dipole included	External field	RMS to Nov. 5, 6 MAGSAT data
1	32°x32°	42	126	NO	YES	33γ
2	32°x32°	43	129	YES	YES	20γ
3	21°x21°	92	276	NO	YES	7γ
4	21°x21°	93	279	YES	YES	7γ
5	16°x16°	162	162	NO	YES	7γ

Figure 1. Power Spectra S_n of Magnetic Field Models